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Mixed fisheries forecasts – lessons learned from their initial application to North Sea fisheries.

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Abstract

Mixed fisheries and technical interactions in European fisheries have been a subject of research for many years. The establishment in 2010 of an ICES Working Group tasked with producing annual mixed fisheries forecasts and advice for North Sea demersal fisheries repres[m] a commitment to use these approaches in routine scientific advice for the first time. The demersal fisheries of the North Sea provide a particularly interesting context for this work due to their high complexity in terms of the numbers of fleets, gears, metiérs and species involved, and also because mixed-fishery effects have contributed to the lack of recovery of the North Sea cod stock. The implementation of mixed-fishery forecasts which account for the fishery complexity and thus allow mixed-fishery effects to be modelled has posed a number of challenges relating to issues such as data requirements and the need to integrate the work with the existing single stock assessments. The explicit representation of the complexity of the fisheries also raises questions about the extent to which mixed fisheries science can be used to give 'advice' in the traditional sense. This paper addresses the challenges and issues that have arisen through the practical implementation of mixed-fishery forecasts, then discusses the further developments that will be required to progress towards more integrated multi-stock management using mixed-fishery management plans.

Keywords: advice, forecasts, mixed fisheries, North Sea.

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Introduction

The demersal fisheries of the North Sea represent a highly complex management problem. The fisheries target seven main species (cod, haddock, whiting, saithe, plaice, sole and *Nephrops norvegicus*). These are caught in a wide range of different fishing gears, and in nearly all cases they are caught as components of mixed fisheries, with the mix of species changing depending on the area, gear and season. In recent years, the North Sea cod stock has been the most high profile of the area's stocks, not least because of its poor state and the resultant implementation of a recovery plan (see e.g. Kraak, et al, 2012). This stock serves to illustrate further aspects of the complexity of North Sea fisheries. For a start the fisheries on the stock are highly international, with seven EU member states and Norway having shares of the quota. It also occupies a large area; according to the data given by Myers et al (2001) the potential area The area occupied by the North Sea cod is much larger than any other cod stock, apart from the North-east Arctic cod.

It can be seen that the North Sea demersal fisheries are a complex set of international, multi-fleet, multi-gear mixed fisheries distributed over a large area. The data compilation process used by WGMIXFISH aggregates the catch and effort data for minor nation/fleet/metier combinations into residual 'other' categories. Nonetheless, once this is done, the remaining number of fleet/gear/metier combinations is still high, with 88 remaining in 2012 for instance. This is a clear illustration of the complexity of the fisheries and hence also the need to account for this in management.

The establishment in 2010 of an ICES Working Group tasked with producing annual mixed fisheries forecasts and advice for North Sea demersal fisheries (WGMIXFISH) represents a commitment to use these approaches in routine scientific advice for the first time. Mixed fisheries and technical interactions in European fisheries have been a subject of research for many years however. The current interest in fleet- and fishery-based approaches has its origins around 2002, when the conflicting states of the various demersal stocks in the North Sea made the limitations of the traditional, single-species approach to advice particularly apparent. The history of the adoption and development of the Fcube approach (after Fleet and Fishery Forecast) used by WGMIXFISH is detailed in ICES (2009a).

Two basic concepts are of primary importance when dealing with mixed-fisheries, the Fleet (or fleet segment), and the Métier. The definitions adopted by WGMIXFISH are*:*

- ***A Fleet segment*** is a group of vessels with the same length class and predominant fishing gear during the year. Vessels may have different fishing activities during the reference period, but might be classified in only one fleet segment.
- ***A Métier*** is a group of fishing operations targeting a similar (assemblage of) species, using similar gear, during the same period of the year and/or within the same area and which are characterized by a similar exploitation pattern

The basis of the model is to estimate the potential future levels of effort by a fleet

corresponding to the fishing opportunities (TACs by stock and/or effort allocations by fleet) available to that fleet, based on fleet effort distribution and catchability by métier. The resulting level of effort is used to estimate landings and catches by fleet and stock, using standard forecasting procedures as used by single species short term forecasts. Unless all single species TAC and/or effort limits are fully consistent across all stocks for all metiers no single effort level is appropriate. Instead effort levels corresponding to fleet behaviour scenarios are calculated.

This paper does not deal with a technical description of the Fcube model (see instead Ulrich et al., 2011) but rather details the challenges and issues that have arisen through the practical implementation of mixed-fishery forecasts before considering future developments and what is required to progress towards more integrated multi-stock management.

The story so far

Nephrops

WGMIXFISH considers 7 stocks; cod, haddock, whiting, saithe, plaice, sole and *Nephrops norvegicus*. Amongst these Nephrops is unique in that the species is found in well defined locations or functional units (FU), with little or no exchange of adults. In addition only some FUs receive an abundance estimate (necessary to calculate a catchability). The solution (first adopted by ICES, 2009b) was to perform the normal Fcube prediction for those FUs with absolute abundance estimates, then to calculate a ratio (R) of the yields to the ICES' advice for the same FUs. For those FUs without absolute abundance estimates, landings resulting from the Fcube run were simply taken to be the most recently recorded landings multiplied by the same ratio R. To do this, landings for each métier had to be apportioned across the FUs.

This was facilitated by the supply of effort and catch data by FU.

Timing – or - It's not just what you do but when you do it

The mixed fisheries forecasting group's need for national effort and catch data to be supplied disaggregated into fleets and metiers was not new. To inform on the effect of effort limitations introduced to complement total allowable catches (TACs) the Scientific, Technical and Economic Committee for Fisheries (STECF) of the EU had been requesting information aggregated according to vessel length, gear type and gear mesh size (where appropriate). WGMIXFISH initially hoped to make use of the data supplied to STECF but the need, for Nephrops, to supply effort and catch data by FU meant this was not possible. WGMIXFISH was also keen to make vessel length categories consistent with those used for the EU's annual economic report (AER) as a version of Fcube using fleet economic data has been developed (Hoff et al. 2010).

Data supply to fisheries working groups is usually dealt with by a small number of people (or even an individual) within national institutes. A separate data request by WGMIXFISH took third priority behind supply of data to single species stock

assessments and the STECF. As such August seemed as early as a mixed fisheries meeting could be held. By the second meeting in 2011, however, it was already clear the timing of the meeting presented a major obstacle to mixed fisheries forecasts forming an integral part of the advice the Commission used in considering adjustments to the fishing opportunities for the following year. In short the policy formulation and consultation process had already progressed too far for new data to be readily taken on board.

At the 2011 meeting the decision was taken to move WGMIXFISH to May so that its advice could be released at the same time as the single species advice by ICES in June. The bottleneck in data supply would be addressed by combining the request for WGMIXFISH and the single species WG, the working group on the assessment of demersal stocks in the North Sea and Skagerrak (WGNSSK). How to achieve this was decided on one day of the meeting given over to a workshop on the issue (ICES 2012a).

A joint and formal data call

The obvious starting point for a new data call was to make use of the DCF categories of fleet and metier defined under the EU data collection framework (DCF) (see appendix IV of Commission Decision 2008/949/EC). It quickly became apparent however that cost constraints, and the nature of national fleets, meant national sampling schemes were not necessarily be the same as the DCF metier matrix. Ignoring the sampling design when raising catch data can lead to significant bias and error in the final estimates of numbers at age/length.

Two additional considerations were necessary. Firstly, three categories of catch data can be considered according to their biological sampling intensity, category 1 (C1) are those strata with adequate biological sampling to provide age disaggregated data, category 3 (C3) are those strata with no sampling and category 2 (C2) are those strata with some samples but where the quality or quantity are not considered robust enough on their own. Secondly ICES had been encouraging working groups to utilise the InterCatch database system to report and raise catch data for a number of years (http://www.ices.dk/datacentre/InterCatch/InterCatch.asp). InterCatch was considered suitable for the metier based data submission but it was recognised the raising and assignment procedures within InterCatch would become cumbersome if the number of categories was allowed to become too large.

The final conclusion was to follow the statistically robust route and request age disaggregated data at the level of the sampling frame. To reduce categories as much as possible while still retaining important fleets as separate categories a request was sent to national institutes to describe their sampling design and map metiers (according to DCF definitions) into C1, C2 and C3 sampling categories.

After receiving the national descriptions a data call was constructed that contained the minimum necessary categories. The call allowed merging across DCF metiers and as such national data entries were sometimes not by métier in the strict sense. The names for the different categories became termed ‘Metier-tags’. Merging of metiers to reduce to a

manageable number going forwards in the Fcube forecasts further leads to the formation of combined or 'supra-metiers' (ICES, 2012c). To test for omissions or other problems with the data call and to test the allocations and raising procedure in InterCatch institutes were asked to submit 2010 data in the new format. Finally a definitive data call was issued as a formal request under the terms of the DCF. A copy of the data call specification is contained in Appendix 1.

Ultimately the use of InterCatch was successful. The raising process for the WGNSSK is fully documented and the final data safely and permanently stored. This is a major advance on the old arrangements where allocations between fleets and raising took place within national institutes and were effectively a 'black box' process. However, depending on the stock involved the raising and allocation process ranged from cumbersome to traumatic and since then considerable effort has been put into streamlining the procedures within InterCatch.

As well as improving the transparency of data supply to WGNSSK and allowing WGMIXFISH to move dates the new data call resulted in much greater consistency in catch totals between the data for the two groups. For cod and whiting there was much greater consistency in summed discard estimates (Figure 1). Values were not the same however because WGMIXFISH was not able to realise its ambition to make use of an extraction of the WGNSSK data. Because they were not incorporated in the design of national sampling frames and to prevent undue burden on the InterCatch system vessel length categories were not included in the InterCatch data. Separate files, based on the data submitted to WGNSSK were still required. Differences arise because the final data set extracted from InterCatch includes cases where discards have been assigned to categories uploaded with only landings data. The data provided to WGMIXFISH, disaggregated by vessel length category and provided in csv files, contains no such assignments. InterCatch data is quarterly and in some cases a metier had raised discard data for some quarters but not others. This lead to different annual discard totals between InterCatch and csv file data. To make the data for Fcube compatible with the InterCatch output the following adjustment was made

$$d^* = \frac{Dl}{L}$$

Where d* is the revised discard value for the metier used by Fcube, l is the weight of landings for the metier used by Fcube and L and D are the weight of landings and discards entered for the (vessel length aggregated) metier in InterCatch.

Complexity, presentation and integration into single species advice

The usual single species stock assessment considers the results from considering the effect of a single set of landings (or landings and discards) as aggregated over all fleets on a single species in a single area. Short term forecasts assume one (exceptionally two) set of assumptions for the intermediate year and present a list of 'catch options' for the TAC year based on different levels of F. The information that can potentially be conveyed in mixed fisheries results will inevitably be greater but the extent of the

increase is surprising and conveying results in a way that does not overwhelm the intended customer has proved quite a challenge.

In 2012, after aggregation of minor fleets into an 'other' (OTH) fleet, the final data used contained 39 national fleets (plus the OTH fleet) from nine. These fleets engage in one to four different métiers each, resulting in 88 combinations of country*fleet*métier*area catching cod, haddock, whiting, saithe, plaice, sole and *Nephrops*. For the intermediate year a single set of assumptions about F has been replaced by the following scenarios:

1) **max**: The underlying assumption was that fishing stops when all quota species are fully utilised with respect to the upper limit corresponding to single stock exploitation boundary.
2) **min**: The underlying assumption was that fishing stops when the catch for the first quota species meets the upper limit corresponding to single stock exploitation boundary.
3) **cod**: The underlying assumption was that all fleets set their effort at the level corresponding to their cod quota share, regardless of other stocks.
4) **sq_E**: The effort was set as equal to the effort in the most recently recorded year for which there are landings and discard data.
5) **Ef_Mgt**: The effort in métiers that used gear controlled by the EU effort management regime had effort adjusted according to the regime.

The intermediate year F values by stock derived from the scenarios are used in two ways. Firstly as input to single-species forecasts, instead of the values from WGNSSK. The single-species forecast uses the same objectives and constraints for the TAC year as in the Baseline Run. Secondly, for each Fcube scenario, the same scenario was applied in the TAC year. In this way the following could be calculated:

- Differences in recommended TACs for 2013 resulting from the single species advice approach being applied to the stock status at the end of the intermediate year of different scenarios and
- An estimate of the cumulative difference between baseline run (single species advice) intermediate year catch plus TAC and realised catches over two years from each scenario.
- In each case the SSB at the end of the TAC year.

Clearly the amount of information to present increases with every additional scenario considered so it is necessary to restrict their number. To date the scenarios involve simple assumptions applied across all fleets and metiers and none is claimed to represent the expected behaviour of the fleets. The max and min scenarios are included to bracket the space of potential catch and SSB outcomes but for most fleets are considered unrealistic scenarios. The remaining scenarios reflect a common assumption in single species forecasts (**sq_E**), the species considered to drive much fisheries policy in the North Sea (**cod**) and assumptions built into the cod long term management plan (**Ef_Mgt**).

Outputs are available for each of the country*fleet*métier*area combinations but it is the

overall effect on stocks that is important and fleet disaggregated results are used mainly for the purpose of cross checks by the working group.
In 2010 ICES advice was given both according to management plans where they were available and according to a transition to Fmsy scheme. WGMIXFISH followed the same approach but this resulted, with Nephrops split by FU, in 270 estimates of catches in the TAC year, more than could sensibly fit on a single page. Subsequently single-species ICES advice has been given according to a single preferred option; management plan if implemented, MSY framework otherwise and the basis for each single stock advice is retained in the mixed-fisheries framework. Even so, the full set of predicted catches and future SSB estimates comprise what is referred to internally as the 'big table', (the 2012 output is reproduced in Table 1).

Making interpretation of the results easier has been attempted through the use of various figures including an in text flow diagram illustrating the contrast between the single species short term forecast and the results after applying one of the scenarios (Figure 2). The most successful summary of outcomes to date is reproduced from the 2012 advice sheet in Figure 3. The figure still needs considerable explanation in its legend and further progress in this area is desirable. Importantly, Figure 3 displays only information on *landings*, i.e. the landings that equates to the (sum of) catchability times effort used in the forecast for each metier, (the discard ratio provided in assessment data is used). Potential overshoot/undershoot on this figure are calculated by comparing the single-stock landings estimates for 2012 with the mixed-fisheries landings estimates. Under a TAC regime an overshoot of landings can only result in undeclared landings or most likely discards. So any overshoots are likely to become discards if the TACs remain the same but to date the mixed fisheries forecasts will only assume status quo discard proportions going forwards. To provide an overview of the amount of total catches for the various scenarios a complementary figure, (Figure 4), is now supplied that displays the catch by category, i.e. potential 'legal' landings (i.e. below the single species TAC, which in practice acts as a TAL), potential 'over TAC' landings, i.e. estimated landings above this official TAC, if any, and discards, as calculated according to the discards ratio observed in assessment data. The assumption here is that discards to date reflect undersize discarding rather than over quota discarding. In the case of cod there is also the issue of 'unallocated removals' estimated by the single species assessment. These are simply considered constant over all scenarios.

Holding WGMIXFISH before the publication of single species advice has also allowed for the incorporation of mixed fishery scenario results in the single species advice sheets. These have the appearance of an additional catch options table and allow those only interested in a single stock to receive the information in a concise format. An example from the 2012 cod advice sheet is reproduced in Table 2.

Future developments

MIXFISH methodology meeting

There is a clear need for ongoing methodological development and for testing the ability to perform mixed fisheries forecasts in further areas. In 2012 a second meeting of

WGMIXFISH was held in late August to consider application of the Fcube mixed fisheries forecasts to the west of Scotland region and to test the feasibility of a scenario request from the EU Commission (see below).

It is hoped a regular ICES WG meeting can be established in its own right to consider future developments. WGMIXFISH has candidate future scenarios (see next section) but continuing difficulties in data supply to WGMIXFISH and very high workload for assessment scientists in the second quarter restrict this WG to production of advice according to established methodology. Also testing the expansion of mixed fisheries projections into further areas needs a meeting separate to one established to produce advice for the North Sea eco-region.

Expansion into further areas

Mixed fisheries projections and advice for North Sea stocks was always envisaged as a first step in developing such advice throughout the ICES regions (ICES 2012b). The successful benchmarking of analytical assessments for two stocks west of Scotland (ICES division VIa) offers the possibility of using the Fcube software in a way similar to in the North Sea. Work to demonstrate the practical implementation of the Fcube method in this area took place in August 2012. The working group on hake, monk and megrim (WGHMM) has also requested the same process be performed for the mixed fisheries of the Iberian waters in 2013.

Mixed-fishery management plans

Perhaps the greatest challenge arises from the current reform of the EU's Common Fisheries Policy (CEC, 2011), which anticipates a move to multi-annual management plans which "should where possible cover multiple stocks where those stocks are jointly exploited". This implies that future multi-annual management plans will include multiple stocks with scope for more explicit accounting for mixed-fishery effects. The work of WGMIXFISH is likely to provide an important component of the routine scientific advice needed to support the implementation of such plans, but there will also be a need to build on the group's work in other ways. This is likely to include the extension of existing mixed-fishery modelling tools to permit the evaluation of candidate management approaches for multiple stocks caught in mixed fisheries. The expertise of the group is also likely to be useful in illustrating and communicating the implications of any such management plan to stakeholders and managers, given the trade-offs that will arise between catches of different stocks by nation, fleet and gear.

Candidate future scenarios

All species fished at Fmsy in 2015

In early 2012 the EU commission requested of ICES mixed fisheries projections using a scenario of all species fished at Fmsy in 2015. Such a scenario – considering the mean F on each stock two years beyond the TAC year – has not been attempted before. Indeed the request is different in concept to the scenarios considered to date because the starting

point is not a scenario but a target that could be achieved through a myriad of scenarios. The request was considered at the August meeting of WGMIXFISH (after the submission deadline for this paper) but a candidate approach is to assume status quo catchabilities going forwards (as for current scenarios), after each year of projection apply the transition to Fmsy scheme for the most limiting, or 'choke', species; assume all fleets conform to the resulting restrictions on catch and/or effort and check to see whether all other species are being fished at Fmsy in 2015 as a natural consequence.

Projected trend in fleet effort levels

The outcomes from previous WGMIXFISH results (ICES, 2009b, 2010), as well as the general evaluation of the successes and failures of the cod long term management plan at STECF/ICES WKROUNDMP (ICES, 2011b) have pointed out the importance of the specification of the intermediate (current) year for minimising implementation error. WGMIXFISH and WKROUNDMP have also investigated the link between fishing effort and fishing mortality for North Sea cod (and Irish Sea cod). The results showed that, although imperfect and not necessarily fully linear, a link was nevertheless observed. In particular, it was shown that the correlation between fishing effort and fishing mortality was visible for the fisheries catching cod as bycatch, but less significant for the targeted fishery.

In 2009 in particular, the TAC advice for cod was based on a literal interpretation of the LTMP stating that F would be reduced by 25% in the first year of implementation, while effort data have shown that only limited effort reduction took place that year (STECF 2010) – and the stock assessment estimated F as not having decreased in 2009. Therefore, although useful in demonstrating the possible outcome if the nominal effort cuts of the effort management regime were translated in full into actual effort cuts (and mean F reductions) the effort management scenario is considered to be unrepresentative of actual outcomes.
In 2012 WGNSSK presented a second options table for cod that, instead of the assumptions of the management plan, used as its basis for the intermediate year a projection of the trend in mean F estimated over recent years. In a similar spirit it would be possible to make use of data from 2003 to estimate trends in effort in the fleets used by WGMIXFISH and project those effort trends forwards into the intermediate and TAC years.

In-year effort comparison

An alternative to projected effort trends would be to evaluate the uptake levels for TACs and effort ceilings in the intermediate (current) year and compare these with their equivalent over the same period the previous year, as a first rough proxy for the actual fishing pressure in the intermediate year. WGMIXFISH 2011 investigated this possibility but found that only some countries could provide information on within-year quota uptake at short notice.

Value scenario

The current **cod** scenario presents the expected outcome if the F reductions on cod stipulated in the cod long term management plan were achieved in full and the relative catchability of different species by fleets and metiers remained constant going forwards. A consequence of this approach is that effort reductions in fleets (to achieve new partial Fs) apply equally to fleets where cod is a major component of the catch and those where it represents a small bycatch component. In 2012 the most pronounced example of this effect was for saithe targeted fisheries where application of the cod scenario lead to small reductions in cod catch but very large reductions in saithe catches.
A scenario examined in the past (Ulrich et al., 2011) weighted the amount of effort a fleet needed to catch each species in its portfolio of catches by the relative value of landings for each species to overall value of landings for that fleet. Because catchability is calculated in Fcube as landings/effort the model has effectively adopted new catchabilities. Previously the scenario then assumed the effort necessary to land all quotas was deployed. Having adjusted catchabilities the technique can be matched with other ideas such as conforming to cod scenario targets.

Hindcasting

The data used by WGMIXFISH extends back to 2003. It is therefore possible to run mixed fisheries projections as they have been performed to date (i.e. taking the most recent year of data and projecting two years forwards) from a total of nine starting points and this number will grow each year. Further, the results from all but the last projection can be compared to the recorded catches of the species involved (or the estimated catch for that year from the single species assessment model if catch data is suspected of bias). The sensitivity of SSB and F results from the current single species assessments to the differences (or errors) in catch predictions from the Fcube scenarios can also be investigated. Existing and proposed scenarios can be compared for their ability to predict actual outcomes. Hindcasting has been performed before as part of the Fcube development under the EU AFRAME project (Iriondo et al. 2012) but to date time pressures have prevented their inclusion in the WGMIXFISH meetings. Assuming space can be found for them the steady increase in historical data might allow selection of a set of realistic scenarios.

Age-disaggregated data

Prior to 2009, precursors to WGMIXFISH compiled age-disaggregated data over a large number of categories. Analyses in 2008 highlighted that the age composition of landings showed distinct differences to that supplied to the single species stock assessment working group (WGNSSK) and therefore WGMIXFISH runs projections on the basis of total landings and discards alone. The new joint data call means that from 2012 age distribution by métier and area is available to WGNSSK in InterCatch and it is ultimately the aim of WGMIXFISH to include age specific data in the projections.

Discussion

The WGMIXFISH scenarios are based on central assumptions that fishing patterns and catchability in intermediate and TAC years are similar to those in the final data year, as in a single-stock forecast where growth and selectivity are assumed constant. However, as for growth and selectivity, it is known that in reality, fleet dynamics will adapt to changes in fishing environment and opportunities. But the direction and magnitude of these changes, occurring at the level of the individual fishers, cannot be easily predicted and integrated in a model. WGMIXFISH has tried to underline therefore that the scenarios are useful for pointing out where the highest risk of imbalance among fishing opportunities might lie, rather than predicting what will happen next year.

In addition the current mixed fishery projections do not say what levels of fishing effort need to be set in order to achieve a desired outcome but rather outline the expected results of given behaviours (behaviours consistent across fleets and with various assumptions of status quo). In single species assessments the goal from a scientific viewpoint has for a long time been to have biological reference points - limit and precautionary levels for spawning stock biomass (SSB) and mean fishing mortality (F) and more recently Fmsy – such that advice can be the level of removals consistent with keeping the stock on the correct side of the reference levels, or at least on the desired trajectory to those safe levels as laid out in a management plan. The advice simply sets out the relationship between removals and F and SSB. How any given level of removals is to be achieved is left to managers.

With a mixed fisheries model that takes explicit account of different catchabilities across species by different fleets a desired collection of F values and/or SSBs can be achieved by a multitude of different controls placed upon the constituent fleets; the assumption of an equal increase/reduction in effort across fleets being but one option. The problem becomes one of deciding which alternative effort control options to present without straying into management decision making. Considering a ‘scenario’ where all species within a mixed fishery are fished at Fmsy confronts the mixed fisheries work with this issue.

Fisheries assessment is conducted by a limited pool of scientists. If mixed fisheries forecasts are to expand into all regions under ICES responsibility, a new meeting for each may be untenable purely from a scheduling viewpoint. Equally, assigning a given meeting with extra areas risks overloading participants and allowing propagation of errors. Ground truthing of results is also best done by those with experience from the single species stock assessments. The ultimate solution may well be to embed the mixed fisheries forecasting into the single species assessment working groups. Indeed, one vision for the future is for advice to become an iterative process whereby Fcube is used to test the likelihood of assumptions made in single species short term forecasts, until the basis for the forecasts become consistent over stocks.

The barrier to imbedded mixed fisheries forecasts remains the provision of suitable, timely and error free data. The joint data call has seen a major advance towards this end

but there exists a continued tension between the level of fleet disaggregation desired for mixed fisheries forecasts and that sensible for age specific raising given the design of national sampling schemes. It is also the case that one should never underestimate the difficulty in obtaining a data set that has been compiled consistently across different institutes. Even with a detailed data call specification (which is seen as essential) misunderstandings can easily occur. Good quality data is essential, and its provision seldom gets the acknowledgment it deserves.

Whether embedded into single species stock assessment meetings or remaining as stand alone meetings operational mixed fisheries forecast meetings need to focus on applying existing methodology. There are many potential advances to the methodology that could be considered but this is best done away from the time pressures of the stock assessment season. As stated above it is hoped a regular ICES WG meeting can be established in its own right to consider future developments. The move would be the mixed fisheries equivalent to the single species stock assessment meetings and the 'methods' meeting (WGMG) tasked with advancing single species stock assessment methodology.

To date operational mixed fisheries forecasts for the North Sea region have been made possible through the application of pragmatic (and simple) solutions and assumptions to the challenges presented and by acknowledging and accommodating the limiting resource (scientists' time) in European fisheries assessment. That being said, the discipline of mixed fisheries projections, certainly operational mixed fisheries forecasts for inclusion in management advice, is in its infancy and there are many lessons being learned in how best to perform them and present their results. The work of WGMIXFISH has evolved rapidly and is likely to continue to do so which, of course, is why it is so addictive.

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List of Tables and Figures

Table 1

	year	scenario	COD	HAD	PLE	POK	SOL	WHG	NEP10	NEP32	NEP33	NEP34	NEP5	NEP6	NEP7	NEP8	NEP9	NEPOTH	*NEP tot*	
landings	**2012**	**baseline**	**40468**	**41575**	**78501**	**87550**	**14969**	**19436**	**89**	**507**	**1531**	**556**	**1353**	**2659**	**9704**	**2425**	**1787**	**1318**	**21929**	
Fbar	**2012**	**baseline**	**0.50**	**0.20**	**0.23**	**0.24**	**0.30**	**0.17**	**-**	**-**	**-**	**-**	**-**	**0.16**	**0.10**	**0.30**	**0.22**	**-**	**-**	**A**
	2013	**baseline**	**0.28**	**0.29**	**0.27**	**0.26**	**0.27**	**0.25**	**-**	**-**	**-**	**-**	**-**	**0.09**	**0.10**	**0.17**	**0.12**	**-**	**-**	
FmultVsF11	**2012**	**baseline**	**0.87**	**0.66**	**1.00**	**0.85**	**1.00**	**1.00**	**-**	**-**	**-**	**-**	**-**	**1.28**	**1.28**	**1.28**	**1.28**	**-**	**-**	
		cod	0.87	0.98	1.08	0.90	0.90	0.83	-	-	-	-	-	0.91	0.90	0.92	0.89	-	-	
		Ef_Mgt	0.77	0.82	0.97	0.89	0.86	0.68	-	-	-	-	-	0.71	0.67	0.70	0.66	-	-	
		max	1.17	1.40	1.35	1.15	1.10	1.11	-	-	-	-	-	1.32	1.30	1.33	1.28	-	-	
		min	0.59	0.66	0.74	0.61	0.65	0.56	-	-	-	-	-	0.61	0.60	0.61	0.59	-	-	
		sq_E	0.97	1.09	1.20	1.00	1.00	0.93	-	-	-	-	-	1.01	1.00	1.02	0.99	-	-	
	2013	**baseline**	**0.50**	**0.97**	**1.18**	**0.92**	**0.90**	**1.42**	**-**	**-**	**-**	**-**	**-**	**0.72**	**1.34**	**0.74**	**0.67**	**-**	**-**	**B**
		cod	0.50	0.56	0.62	0.51	0.51	0.48	-	-	-	-	-	0.52	0.51	0.52	0.50	-	-	
		Ef_Mgt	0.57	0.55	0.80	0.78	0.79	0.42	-	-	-	-	-	0.40	0.34	0.38	0.34	-	-	
		max	1.51	1.70	1.86	1.54	1.55	1.44	-	-	-	-	-	1.57	1.55	1.58	1.53	-	-	
		min	0.43	0.48	0.53	0.44	0.44	0.41	-	-	-	-	-	0.44	0.44	0.45	0.43	-	-	
		sq_E	0.97	1.09	1.20	1.00	1.00	0.93	-	-	-	-	-	1.01	1.00	1.02	0.99	-	-	
landings	**2012**	**baseline**	**40468**	**41575**	**78501**	**87550**	**14969**	**19436**	**89**	**507**	**1531**	**556**	**1353**	**2659**	**9704**	**2425**	**1787**	**1318**	**21929**	
		cod	40468	59162	84247	91805	13648	16399	62	356	1074	390	949	1879	6791	1728	1233	925	15388	
		Ef_Mgt	36616	50750	76610	91361	13111	13453	47	269	813	295	718	1472	5076	1330	924	700	11645	
		max	50432	79619	102663	113471	16206	21471	90	516	1557	566	1376	2723	9843	2505	1787	1340	22302	
		min	29266	41575	59840	65094	10222	11235	42	239	721	262	637	1261	4559	1160	828	621	10330	
		sq_E	43986	64849	92735	100645	14969	18140	69	396	1196	435	1057	2092	7561	1924	1372	1029	17131	
	2013	**baseline**	**25441**	**47811**	**97072**	**100682**	**13850**	**27242**	**150**	**1000**	**1500**	**600**	**1000**	**1493**	**10116**	**1388**	**938**	**819**	**19004**	**C**
		cod	25441	26404	52270	58861	8565	9915	33	188	567	206	501	1071	3869	984	702	488	8608	
		Ef_Mgt	29778	27134	68415	86417	12863	8966	23	129	390	142	345	835	2537	723	466	336	5926	
		max	53064	60846	133321	142287	21222	27242	100	570	1720	625	1520	3249	11743	2988	2132	1480	26127	
		min	25441	25261	48690	55095	7920	8823	28	161	486	177	429	918	3319	844	602	418	7384	
		sq_E	42207	46419	94313	104000	15163	18558	64	367	1108	402	978	2092	7561	1924	1372	953	16821	
Ld_MgtPlan	**2013**	**cod**	**25441**	**44733**	**97071**	**100682**	**13770**	**27242**	**150**	**1000**	**1500**	**600**	**1000**	**1493**	**10116**	**1388**	**938**	**819**	**19004**	
		Ef_Mgt	25441	46922	97072	100682	13770	27242	150	1000	1500	600	1000	1493	10116	1388	938	819	19004	
		max	25441	39466	97072	100682	14650	27242	150	1000	1500	600	1000	1493	10116	1388	938	819	19004	**D**
		min	25441	47811	97071	100682	13770	27242	150	1000	1500	600	1000	1493	10116	1388	938	819	19004	
		sq_E	25441	43260	97072	100682	13850	27242	150	1000	1500	600	1000	1493	10116	1388	938	819	19004	
ssb	**2012**	**baseline**	**62658**	**269855**	**589341**	**216941**	**46654**	**306738**												
	2013	**baseline**	**72215**	**253352**	**628143**	**235149**	**47145**	**312484**												
	2014	**baseline**	**94531**	**202475**	**666278**	**252159**	**48665**	**344880**												
ssb	**2013**	cod	72215	231312	618855	231394	48513	316515												
		Ef_Mgt	76747	241833	631205	231786	49070	320426												
		max	60727	205904	589230	212379	45864	309783												
		min	85519	253352	658453	255076	52068	323373												**E**
		sq_E	68119	224223	605172	223613	47145	314204												
	2014	cod	94531	206802	724294	285675	55522	370219												
		Ef_Mgt	95618	216586	715749	261176	51645	374022												
		max	45407	138680	556375	189892	39775	343043												
		min	113955	230664	785088	316284	59816	376138												
		sq_E	67965	174744	638905	236154	47310	357404												
ssb_MgtPlan	**2014**	cod	94531	183990	653443	247913	50141	347616												
		Ef_Mgt	101147	191917	670516	248356	50708	350265												
		max	77780	164837	612673	226390	46533	343043												**F**
		min	113955	202475	708338	274659	53762	352258												
		sq_E	88554	178647	634579	239112	48665	346047												

Table 2.

Outlook Table B Basis: F trend assumption F (2012) based on trend over 2006-2010 = 0.5; Recruitment (2012) re-sampled 1998–2011 = 200 million; SSB (2013) = 75.7; HC landings (2012) = 42.6; Discards (2012) = 10.9; Unallocated removals = 14.4.

Rationale	**Landings[1] (2013)**	**Basis**	**F_{total} (2013)**	**F_{land} (2013)**	**F_{disc} (2013)**	**F_{unal}[2] (2013)**	**Disc (2013)**	**Unal[2] (2013)**	**SSB (2014)**	**%SSB[3] Change**	**%TAC[4] Change**
Management Plan	25.441	TAC constraint	0.27	0.16	0.06	0.06	6.6	8.6	103	+36%	-20%
MSY framework	10	F_{MSY}* $SSB_{2013}/B_{trigger}$	0.10	0.06	0.02	0.02	2.5	3.4	123	+63%	-69%
MSY transition	28	Transition rule	0.29	0.17	0.06	0.06	7.2	9.4	101	+33%	-13%
Zero Catch	0	F=0	0.00	0.00	0.00	0.00	0.0	0.0	136	+80%	-100%
Other options	19	F_{MSY}	0.19	0.11	0.04	0.04	4.9	6.4	112	+47%	-41%
	25.441	TAC_{2012}–20%	0.27	0.16	0.06	0.06	6.6	8.6	103	+36%	-20%
	38.161	TAC_{2012}+20%	0.43	0.25	0.09	0.09	10.2	13.0	87	+15%	+20%
	43	F_{2012}	0.50	0.29	0.10	0.11	11.7	14.8	81	+7%	+36%
	43	Landings 2012	0.49	0.28	0.10	0.10	11.5	14.6	82	+8%	+34%
Mixed fisheries options – minor differences with calculation above can occur due to different methodology used (ICES, 2012b)											
Maximum	49	A	0.77	NA	NA	NA	NA	NA	50	-34 %	+55 %
Minimum	25	B	0.25	NA	NA	NA	NA	NA	114	51 %	-20 %
Cod MP	25	C	0.29	NA	NA	NA	NA	NA	95	+25 %	-20 %
SQ effort	42	D	0.55	NA	NA	NA	NA	NA	68	-10%	+33 %
Effort_Mgt	30	E	0.32	NA	NA	NA	NA	NA	96	+26 %	-6 %

Units: ‘000 tonnes.

[1] Landings do not include unallocated mortality.

[2] Unallocated removals (calculated by dividing total by average catch multiplier in last three years).

[3] SSB 2014 relative to SSB 2013.

[4] Landings 2013 (not including unallocated removals) relative to TAC 2012.

Mixed Fisheries assumptions:

A. Maximum scenario: Fleets stop fishing when last quota exhausted
B. Minimum scenario: Fleets stop fishing when first quota exhausted
C. Cod management plan scenario: Fleets stop fishing when cod quota exhausted
D. SQ effort scenario: Effort in 2012 and 2013 as in 2011
E. Effort management scenario: Effort reductions according to cod and flatfish management plans

Figure 1

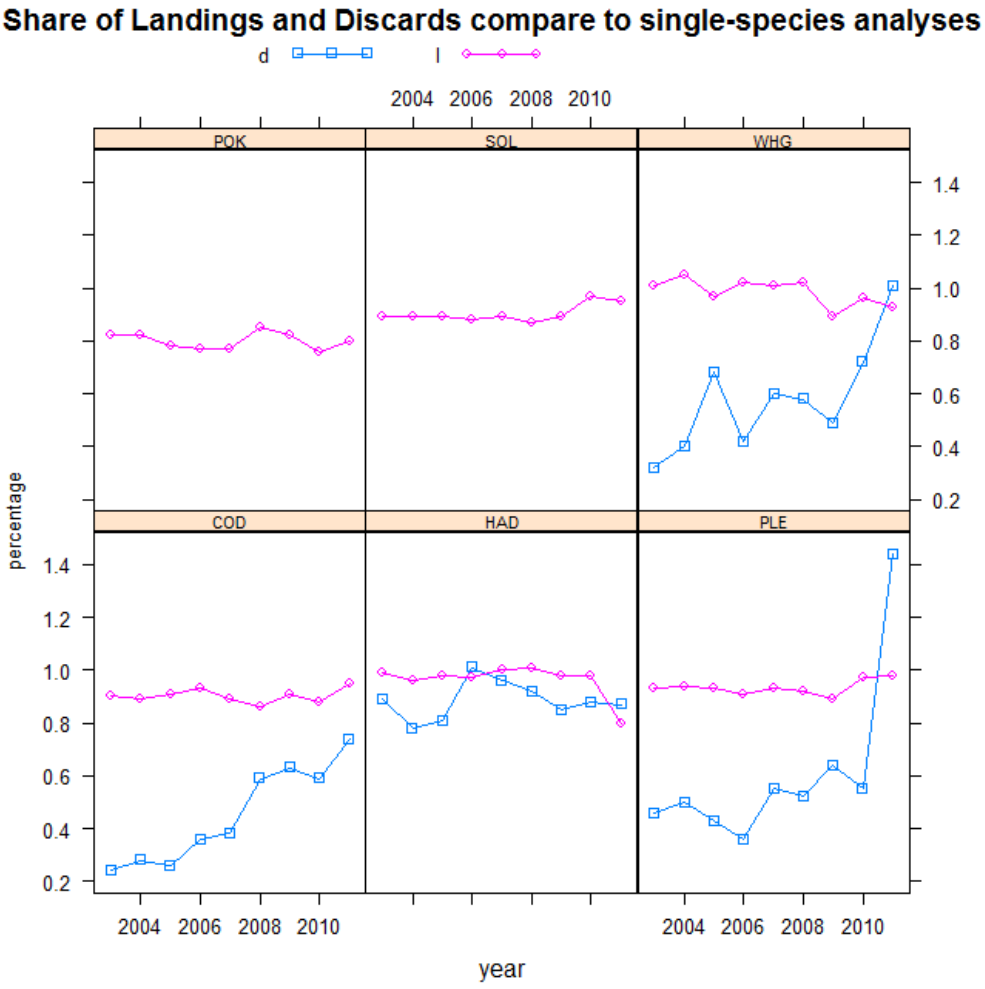

Share of Landings and Discards compare to single-species analyses
d
l
POK
SOL
WHG
COD
HAD
PLE
percentage
year
2004
2006
2008
2010
0.2
0.4
0.6
0.8
1.0
1.2
1.4

Figure 2.

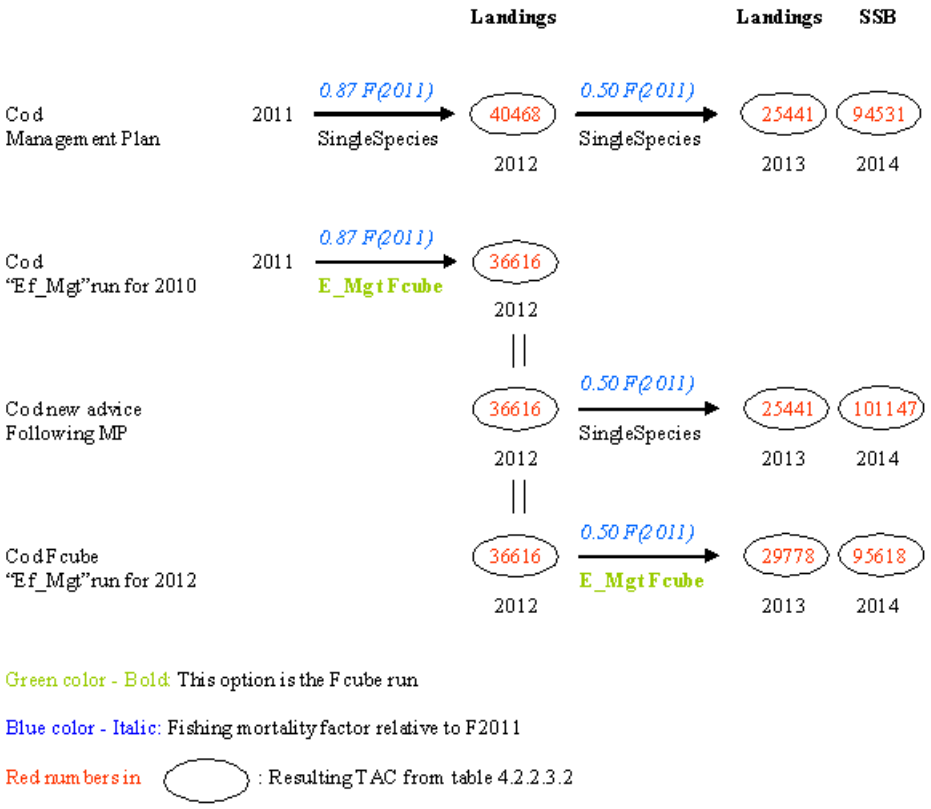

Landings
Landings
SSB
Cod
Management Plan
2011
0.87 F(2011)
SingleSpecies
40468
2012
0.50 F(2011)
SingleSpecies
25441
2013
94531
2014
Cod
"Ef_Mgt"run for 2010
2011
0.87 F(2011)
E_Mgt Fcube
36616
2012
Cod new advice
Following MP
36616
2012
0.50 F(2011)
SingleSpecies
25441
2013
101147
2014
Cod Fcube
"Ef_Mgt"run for 2012
36616
2012
0.50 F(2011)
E_Mgt Fcube
29778
2013
95618
2014
Green color - Bold: This option is the Fcube run
Blue color - Italic: Fishing mortality factor relative to F2011
Red numbers in : Resulting TAC from table 4.2.2.3.2

Figure 3.

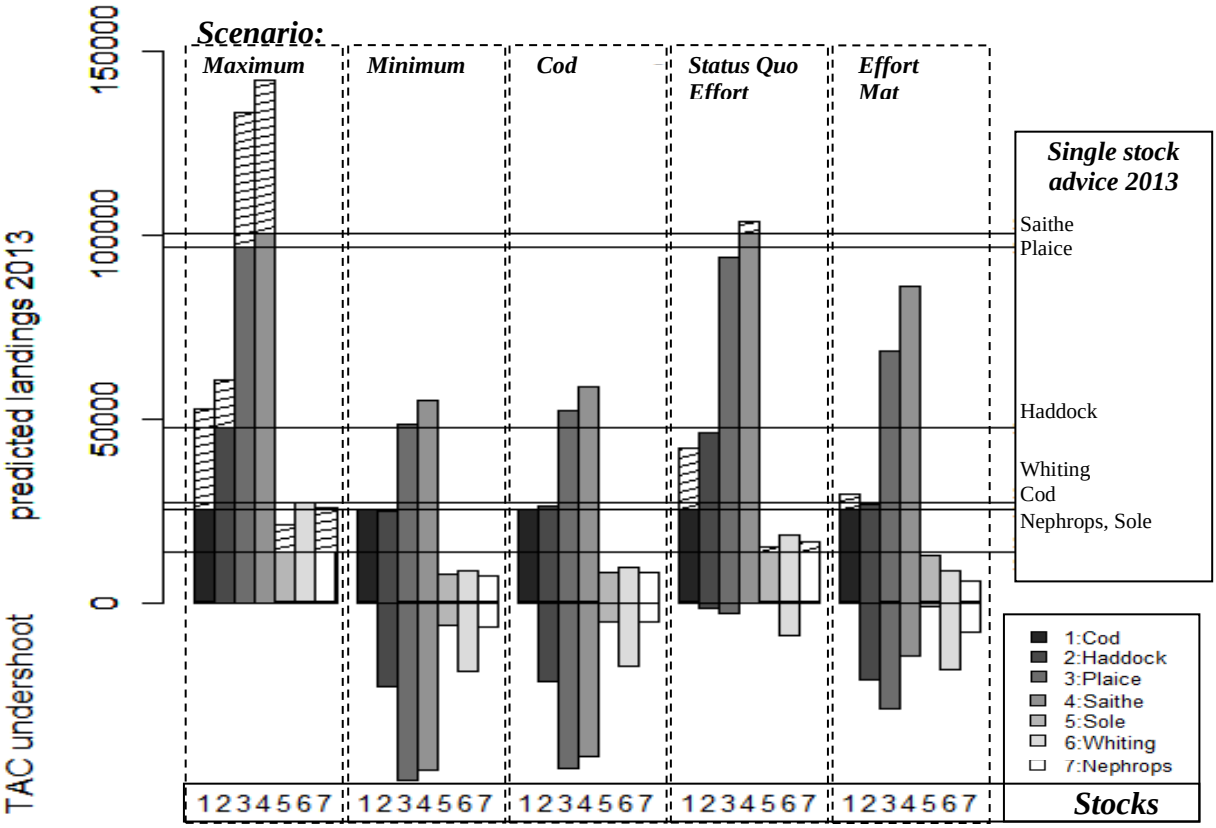
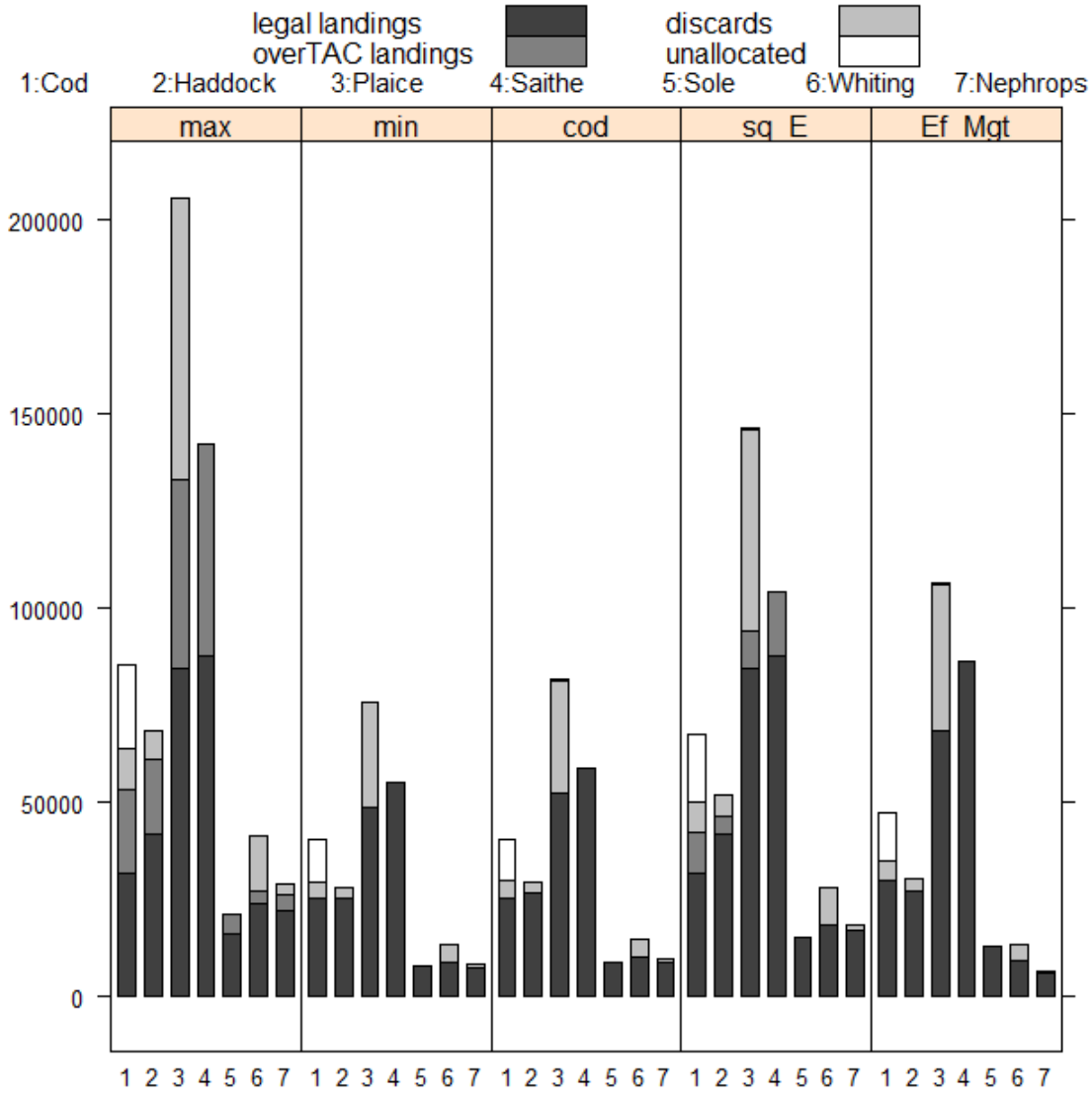

Scenario:
Maximum
Minimum
Cod
Status Quo Effort
Effort Mat
predicted landings 2013
TAC undershoot
150000
100000
50000
0
Single stock advice 2013
Saithe
Plaice
Haddock
Whiting
Cod
Nephrops, Sole
1:Cod
2:Haddock
3:Plaice
4:Saithe
5:Sole
6:Whiting
7:Nephrops
1234567 1234567 1234567 1234567 1234567
Stocks

Figure 4.


legal landings
overTAC landings
discards
unallocated
1:Cod
2:Haddock
3:Plaice
4:Saithe
5:Sole
6:Whiting
7:Nephrops
max
min
cod
sq E
Ef Mgt
200000
150000
100000
50000
0
1 2 3 4 5 6 7

Appendix 1: ICES data call for WGNSSK and WGMIXFISH

Data call: Data submission for ICES working Groups WGNSSK & WGMIXFISH

Rationale

The mix fisheries advice to the EU and Norway regarding the species in the North Sea is elaborated on the basis of the best available survey and commercial data.

Scope of call

ICES Countries are requested to supply landings, discards, biological sample and effort data from 2011. This information should be according to one or more of the metiers listed in Annex 1. The minimum list of species for which data should be prepared according to Annex 1 is given below and in Appendix 8. The species should be reported for the areas in the area list below.

	COMMON SPECIES NAME	CODE	SCIENTIFIC SPECIES NAME
1	Cod	COD	Gadus morhua
2	Common sole	SOL	Solea solea
3	Haddock	HAD	Melanogrammus aeglefinus
4	Plaice	PLE	Pleuronectes platessa
5	Saithe	POK	Pollachius virens
6	Whiting	WHG	Merlangius merlangus
7	Norway lobster	NEP	Nephrops norvegicus

Area list

AREA	AREA CODE
North Sea (IV)	IV
Skagerrak (IIIaN)	IIIaN
Eastern Channel (VIId)	VIId

Deadline

30 March 2012.

Data to be reported

Landings, discards, sample and effort data from 2011 according to one or more of the metiers listed in Annex 1.

Additionally information by vessel length categories are also requested, please see section 'Aggregation vs. WGMIXFISH Requirements'.

Format to report

The InterCatch format should be used.

Additionally information by vessel length categories should be in comma separated (CSV) file, please see section 'Aggregation vs. WGMIXFISH Requirements'

How to report

The InterCatch formatted national data should be imported into InterCatch. Please use the following link: http://intercatch.ices.dk

Additionally information by vessel length categories should be electronically sent to:

Clara Ulrich [clu@aqua.dtu.dk] -- Chair of WGNSSK

Steven Holmes [s.holmes@marlab.ac.uk] -- Chair of WGMIXFISH

The entries in Annex 1 follow closely the naming convention used for the EU Data Collection Framework (DCF). An explanation of the elements of these metier tags follows:

1. *GEAR TYPE (gear types available under the DCF are shown in Appendix 1. Data can be aggregated over more than one category but in this case the most significant gear type is entered. The aggregations assumed in forming Annex 1 are also shown in Appendix 1)*
2. *METIER CODE (code conforming to target assemblage code of DCF, see Appendix 2. Data can be aggregated over more than one category but in this case the most significant metier code is entered)*
3. *MESH SIZE RANGE (mesh size ranges available under the DCF, see Appendix 3. Data can be aggregated over more than one category but in this case the most significant mesh size range is entered.* ***If for that gear type data has been aggregated over all ranges used by a nation an additional (to the DCF) entry "all" can be used****.)*
4. *SELECTIVITY DEVICE (types of selectivity device available under the DCF are shown in Appendix 4.)*
5. *SELECTIVITY DEVICE MESH SIZE (the actual mesh size of any selectivity device is entered.)*
6. *VESSEL LENGTH CLASS (Member states have indicated national sampling scheme designs do not take account of vessel lengths. Therefore only the non-standard entry of "all" is currently provided for in InterCatch.)*
7. *FULLY DOCUMENTED FISHERIES (If the metier tag defines a fully documented fishery add "_FDF" after length class – but see note below).*

An underscore separates these elements.
Note: Country and area are supplied to InterCatch separately. Country codes are as shown in Appendix 6. Area codes are as shown in Appendix 7. It is stressed that to reduce the number of

entries required in InterCatch data is requested according to the areas shown in Appendix 7 and **not** according to finer spatial resolutions.

IMPORTANT:

- When uploading to InterCatch the year is the data year, which must be entered as **2011.**
- If discard data is unavailable there should be no entry for discards. A value of zero should only be entered when zero discards have been observed.

Effort Data

Effort is required in kWdays. Effort is recorded in position 11 of the InterCatch header information.

Fully Documented Fisheries

To prevent a requirement for large numbers of metier tags to be held within InterCatch metier tags for fully documented fisheries will be added on a case by case basis. If national data submitters have a fully documented fishery for which there is landings and discard data and which they wish to submit as a unique metier they should contact Henrik Kjems-Nielsen [henrikkn@ices.dk], the contact point for InterCatch.

Aggregations

If national data are aggregated over several DCF level 6 categories, the metier tag corresponding to the most significant category is chosen e.g. a mobile gear with mesh sizes covering 70-119 mm (combining 70-99 and 100-119) but 70-99mm is most significant – code 70-99. Exceptions to this general rule are cases where data has been aggregated over all

- mesh size ranges

within the national fleet. In these instances the tag "all" can be entered.

In addition Member states have indicated national sampling scheme designs do not take account of vessel lengths and therefore only the non-standard entry of "all" is currently provided for in InterCatch against vessel length. The option has been left open for length category specific metier tags to be added in future years if nations begin to sample and raise data independently for different length categories.

Aggregations vs. WGMIXFISH Requirements

Age specific data is best raised and entered to InterCatch using metiers / groups of vessels that match national sampling schemes. For 2011 data this means that the vessel length categories will be omitted in the data submitted to InterCatch (e.g. metier tag TBB_DEF_>=120_0_0_all). This is sufficient to address the data needs for WGNSSK. However, - for otter and beamtrawl gears only - these aggregations may be too broad for WGMIXFISH needs (leading to overly large fleet entries in the mixed fisheries projections). To fulfil the additional WGMIXFISH specific need for information by vessel length categories[1], we kindly request estimates of catch weight totals and effort in a format similar to previous WGMIXFISH data calls (albeit using the Metier Tags as used to supply InterCatch) i.e. :

[1] Also, in order to insure consistency and continuity with the data time series previously collected by WGMIXFISH.

A comma separated (CSV) 'effort' file containing the following entries :

ID, Country, Year, Quarter, Length disaggregated Metier Tag, Area, KW_Days, Days At Sea, No Vessels

A CSV 'catch' file containing the following entries :

ID, Country, Year, Quarter, Length disaggregated Metier Tag, Area, Species, Landings (tonnes), Discards (tonnes), Value (average price*landings at first sale, expressed in Euros).

- Length categories are <10m; 10<24m; 24<40m and >=40m.
- Vessel length splits are only required for metier tags starting OTB or TBB.

Sums of effort and catch across metier tags disaggregated by vessel length should equal the corresponding totals submitted to Intercatch.

Example:

If a nation submitted data to InterCatch according to TBB_DEF_>=120_0_0_all but this data comes from vessels of 24<40m and >=40m WGMIXFISH requests CSV files for entries of

TBB_DEF_>=120_0_0_24<40 and
TBB_DEF_>=120_0_0_>=40

The CSV files should be submitted electronically to
Clara Ulrich [clu@aqua.dtu.dk] -- Chair of WGNSSK
Steven Holmes [s.holmes@marlab.ac.uk] -- Chair of WGMIXFISH

Supporting Documentation and work to be undertaken after the data upload

Once data has been submitted to InterCatch a process of fill-ins will be undertaken by the respective stock coordinators for entries containing only bulk weight of landings and/or discards. **To aid this process countries are requested to complete a documentation file (EXCEL spreadsheet) in a format like that shown in Annex 2.**
The documentation spreadsheet should be submitted electronically to
Clara Ulrich [clu@aqua.dtu.dk] -- Chair of WGNSSK
Steven Holmes [s.holmes@marlab.ac.uk] -- Chair of WGMIXFISH

For InterCatch related questions contact: Henrik Kjems-Nielsen [henrikkn@ices.dk]

Conversions to InterCatch Format

A description of the InterCatch Exchange format can be downloaded at the InterCatch information webpage under 'Manuals':

http://www.ices.dk/datacentre/InterCatch/InterCatch.asp

A two page overview of the fields in the InterCatch commercial catch format can be found at the same page, again under 'Manuals' (just below the InterCatch Exchange format manual). From this page the valid codes can be seen.

To ease the process of converting the national data into the InterCatch format Andrew Campbell from Ireland has made a conversion tool ‘InterCatchFileMaker’, which converts data manually entered in the ‘Exchange format spreadsheet’ into a file in the InterCatch format. The conversion tool ‘InterCatchFileMaker’ can be downloaded at the InterCatch information page (the one above) under ‘Program to convert to InterCatch file format’. The download includes a spreadsheet in which the landings and sampling data can be placed; the converter then converts the data in the spreadsheet into the InterCatch format.

Annex 1

AREA	GEAR TYPE	AVAILABLE METIER TAGS FOR FULLY DOCUMENTED FISHERIES ADD "_FDF" AFTER LENGTH CLASS.
IIIaN (Skagerrak) Area Type = SubDiv		TBB_DEF_90-99_0_0_all
		TBB_DEF_>=120_0_0_all
	Otter trawl	OTB_CRU_13-31_0_0_all
		OTB_CRU_32-69_0_0_all
		OTB_CRU_32-69_2_22_all
		OTB_CRU_70-89_2_35_all
		OTB_CRU_90-119_0_0_all
		OTB_ DEF _>=120_0_0_all
	Seines	SDN_DEF_>=120_0_0_all
		SSC_DEF_>=120_0_0_all
	Gill, trammel, drift nets	GNS_DEF_100-119_0_0_all
		GNS_DEF_120-219_0_0_all
		GNS_DEF_>=220_0_0_all
		GNS_DEF_all_0_0_all
		GTR_DEF_all_0_0_all
	Lines	LLS_FIF_0_0_0_all
	Others (Human consumption)	DemHC
	Others (Industrial bycatch)	DemIBC
IV – (North Sea) Area type = SubArea & VIId (Eastern Channel) Area Type = SubDiv		TBB_DEF_70-99_0_0_all
		TBB_DEF_>=120_0_0_all
	Otter trawl	OTB_CRU_13-31_0_0_all
		OTB_CRU_32-69_0_0_all
		OTB_SPF_32-69_0_0_all
		OTB_CRU_70-99_0_0_all
		OTB_ DEF _>=120_0_0_all
	Seines	SDN_DEF_>=120_0_0_all
		SSC_DEF_>=120_0_0_all
	Gill, trammel, drift nets	GNS_DEF_100-119_0_0_all
		GNS_DEF_120-219_0_0_all
		GNS_DEF_>=220_0_0_all
		GNS_DEF_all_0_0_all
		GTR_DEF_all_0_0_all
	Lines	LLS_FIF_0_0_0_all
	Pots and Traps	FPO_CRU_0_0_0_all
	Others (Human consumption)	DemHC
	Others (Industrial bycatch)	DemIBC

Appendix 1 Gear coding (as defined under the DCF). Codes made available in the WGNSSK-WGMIXFISH data call are shown in the left hand column and are based on information from countries fishing in areas IIIaN, IV and VIId about significant fishing gears.

Code available in WGNSSK-WGMIXFISH data call	DCF code	Type of gear
TBB	TBB	Beam trawl
OTB	OTB	Bottom otter trawl
	OTT	Multi-rig otter trawl
	PTB	Bottom pair trawl
	OTM	Midwater otter trawl
	PTM	Midwater pair trawl
SSC	SSC	Fly shooting (Scottish) seine
	SPR	Pair seine
	PS	Purse seine
SDN	SDN	Anchored seine
	SB, SV	Beach and boat seine
GNS	GNS	Set gillnet
	GND	Driftnet
GTR	GTR	Trammel net
LLS	LHP	Pole lines
	LHM	Hand lines
	LLS	Set longlines
FPO	FPO	Pots and Traps
DemHC	FYK	Fyke nets
	FPN	Stationary uncovered pound nets
	DRB	Boat dredge
	HMD	Mechanised/ Suction dredge
	OTH	Other

Appendix 2 Target assemblage (metier code)

The codes in the table below are those permitted under the DCF. Those highlighted in yellow are not yet implemented but can be used.

Code	Definition
DEF	Demersal fish
CRU	Crustaceans
SPF	Small pelagic fish
LPF	Large pelagic fish
MOL	Molluscs
DWS	Deep-water species
FIF	Finfish
CEP	Cephalopods
CAT	Catadromous

GLE	Glass eel
MPD	Mixed pelagic and demersal fish
MDD	Mixed demersal and deepwater species
MCD	Mixed crustaceans and demersal fish
MCF	Mixed cephalopods and demersal fish

Appendix 3 Mesh size coding

Mesh size categories below are those permitted under the DCF. Data should be provided according to the categories below or aggregations of the categories below.
If data is aggregated over categories the most significant category is entered e.g. a mobile gear with mesh sizes covering 70-119 mm (combining 70-99, and 100-119) but 70-99mm is most significant receives code 70-99.

Gear type	Area	Code
Mobile gears	IIIaN (Skagerrak)	<16
		16-31
		32-69
		70-89
		90-119
		>=120
	IV & VIId (North Sea and Eastern Channel)	<16
		16-31
		32-69
		70-99
		100-119
		>=120
Passive gears	Whole of IIIaN, IV and VIId	10-30
		50-70
		90-99
		100-119
		120-219
		>=220

Appendix 4 Selectivity device

Selectivity devices are defined under the DCF as follows

Description	Code
None mounted	0
Exit window/selection panel	1
Grid	2
Unknown	3

Appendix 5 Vessel Length

Length categories permitted under the DCF are shown. For 2012 only the non-standard entry of "all" is currently provided for in InterCatch against vessel length. The option has been left open for length category specific metier tags to be added in future years.

DCF categories	
Vessel Length	*Code*
Under 10m	*<10*
10 to 12 m	*10<12*
≥ 12m <18m	*12<18*
≥ 18m < 24m	*18<24*
≥24m < 40m	*24<40*
≥ 40m	*>=40*

Appendix 6 Country coding (as used currently by InterCatch)

BE	Belgium
CA	Canada
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland
FO	Faroe Islands
FR	France
GG	UK (Channel Island Guernsey)
GL	Greenland
IE	Ireland
IM	UK (Isle of Man)
IS	Iceland
IT	Italy
JE	UK (Channel Island Jersey)
LT	Lithuania
LV	Latvia
NL	Netherlands
NO	Norway
PL	Poland
PT	Portugal
RU	Russia
SE	Sweden
UK	United Kingdom
UKE	UK (England)
UKN	UK(Northern Ireland)
UKS	UK(Scotland)
US	United States

Appendix 7 Area coding

Codes accepted by InterCatch. Overall the codes are unique to this exercise because of the desire to receive data on Nephrops by Functional Unit (FU).

Finfish (or Nephrops if not possible to raise by Nephrops Functional Units)	***Nephrops only***		
	Functional Unit	***InterCatch Code***	***Area Type Code***
IIIaN (Skagerrak)	FU5[1]	IV5	Div
IV (ICES sub-area IV)	FU6	IVb6	SubDiv
VIId (ICES division VIId)	FU7	IVa7	SubDiv
	FU8	IVb8	SubDiv
	FU9	IVa9	SubDiv
	FU10	IVa10	SubDiv
	FU32[1]	IV32	Div
	FU33	IVb33	SubDiv
	FU34	IVb34	SubDiv

1: FU5 is found in both ICES divisions IVb and IVc and FU32 is found in both ICES divisions IVa and IVb.

Nephrops Functional Units and descriptions by statistical rectangle follow

Functional Unit	Stock	ICES Rectangles	Division
5	Botney Gut	36-37 F1-F4; 35F2-F3	IV
6	Farn Deep	38-40 E8-E9; 37E9	IV
7	Fladen	44-49 E9-F1; 45-46E8	IV
8	Firth of Forth	40-41E7; 41E6	IV
9	Moray Firth	44-45 E6-E7; 44E8	IV
10	Noup	47E6	IV
32	Norwegian Deep	44-52 F2-F6; 43F5-F7	IV
33	Off Horn Reef	39-41F4; 39-41F5	IV
34	Devil's Hole	41-43 F0-F1	IV

Appendix 8.

Species for inclusion in WGNSSK-WGMIXFISH joint data call.

Whitefish species coding according to Council Regulation (EC) No. 2298/2003 and as used in InterCatch.

	Common name	***Code***	***Scientific name***
1	*Cod*	*COD*	*Gadus morhua*
2	*Common sole*	*SOL*	*Solea solea*
3	*Haddock*	*HAD*	*Melanogrammus aeglefinus*
4	*Plaice*	*PLE*	*Pleuronectes platessa*
5	*Saithe*	*POK*	*Pollachius virens*
6	*Whiting*	*WHG*	*Merlangius merlangus*
7	*Norway lobster*	*NEP*	*Nephrops norvegicus*

Annex 2

The documentation spreadsheet
Example of how to describe specific DCF categories contributing to supra-metiers uploaded to InterCatch

Metier code WGMIXFISH	Area	Vessel length classes	Gear types	Mesh size range	Description
OTB_CRU_70-99_0_0_all	4	<10 10<12 12<18 18<24 24<40 >=40	OTB OTT PTB SSC	70-99	Bottom trawls with mesh size >=70 & < 100 mm. No distinction between gear with or without selective devices. Notes NEP7 - majority of vessels 18<24 length with use of OTT gear. NEP8 & NEP9 - majority of vessels 12<18 length.
OTB_DEF_>=120_0_0_all	4	<10 10<12 12<18 18<24 24<40 >=40	OTB OTT PTB SSC	100-119 >=120	Bottom trawls with mesh size >=100mm. No distinction between gear with or without selective devices.
FPO_CRU_0_0_0_all	4	<10 10<12 12<18 18<24 24<40 >=40	FPO	na	Creels There are very small amounts of creel landings - no sampling. Mostly <10m vessels